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# JANDUS

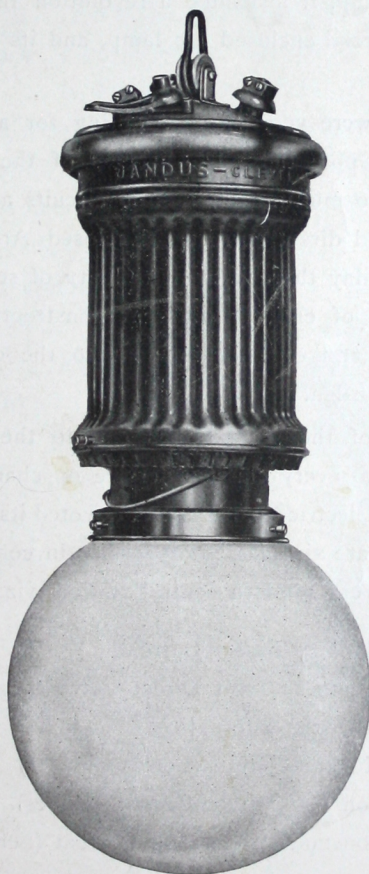
## Interchangeable Arc Lamps

FOR PUBLIC AND PRIVATE ARC LIGHTING

ALL CIRCUITS

Bulletin  
No. 20

September  
1904



PERFECT INTER-  
CHANGEABILITY

TWO HUNDRED  
HOURS' LIFE

UNIFORM  
TWELVE INCH  
CARBON TRIM

THE JANDUS ELECTRIC CO.

CLEVELAND

NEW YORK  
114 Liberty Street

PHILADELPHIA  
Real Estate Trust Bldg.

CHICAGO  
Monadnock Bldg.

1091-B2489 T2F



# The JANDUS Interchangeable Enclosed Arc Lamp.

**W**HEN in 1894 The Jandus Electric Company brought out its Standard Enclosed Arc Lamp, it instituted a revolution in Arc Lighting. This was the first commercial enclosed arc lamp, and its success was immediate and universal.

The conditions then were very simple, calling for a long life lamp on direct current circuits of constant potential. The success of the new lamp soon led to a demand for its application to multiple alternating circuits and later to constant current circuits, both alternating and direct current. Enclosed Arc Lamps were designed to meet these demands, and to-day there is a multiplicity of such lamps. Central stations have now in use arc lamps of entirely different construction for different classes of service, and the confusion and expense incident to the care and maintenance of so many types of lamps is a burden.

To the simplification of these conditions and to the production of a single enclosed arc lamp applicable to every class of service or character of circuit, the engineering force of The Jandus Electric Company has devoted its time for several years. The task was not easy. There are six classes of service in common use, several of which are employed by almost every modern central station, viz:

110 volt Direct Current,  
220 to 250 volt Direct Current,  
Multiple Alternating,  
Multiple-Series, (Power Circuits)  
Constant Direct Current (Series), and  
Constant Alternating Current (Series).

The problem has been :

**First.** To produce a *Common Arc Lamp Structure* adapted to each one of the above mentioned six classes of service and embodying all of the features required by the best modern practice; and,

**Second.** To produce therefrom by simple adaptations, six lamps, each of which shall be best for its particular service.



This great task has been successfully performed and the result is the *Jandus Interchangeable Enclosed Arc Lamp*, a single logical structure now presented to the public for every department of arc lighting. At the date of this writing, it is no longer experimental, but has gone into service to the extent of many thousands in many important installations. It is an unqualified success, and marks a step in advance nearly if not quite as great as that made by The Jandus Electric Company, when it originally introduced the enclosed arc lamp to the public.

### THE COMMON STRUCTURE.

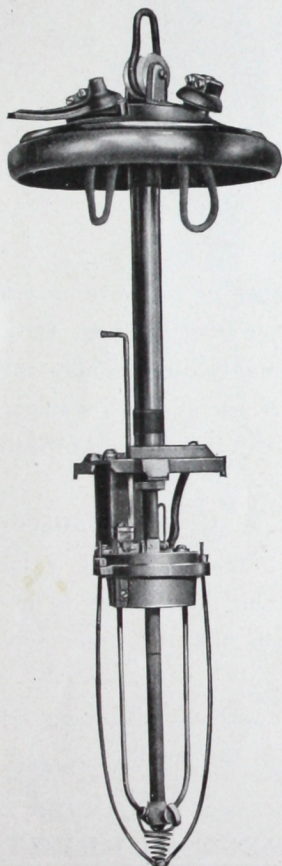


Figure I-1.

**A**TENTION is first called to the main or common structure, illustrated externally and internally in Figures 80 and I-1. This structure, with casing and globes, constitutes a complete arc lamp, with the exception of the regulating mechanism, and is so designed that mechanisms adapted for the several kinds of circuits may be placed in and secured to the structure, without taking a part the latter. Nothing could be more simple. Here is an arc lamp complete except as to magnets and a few working parts. Several interchangeable actuating mechanisms are provided to fit it. Introduce the desired mechanism,

and we have the desired lamp; and this is done without any disturbance of the main structural unit.

The common structure consists of the hood, which carries the switch, the center tube removably attached to the hood, and carrying at its lower end the expansion and diffusion

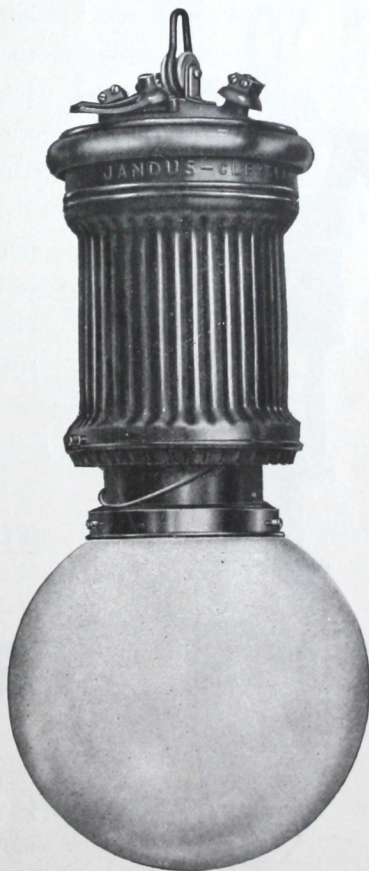


Figure 80.

Complete Lamp with No. 16 Outer Globe.



chamber, the floor plate, the globe cap, the lower carbon holder and inner globe holder. The clutch is part of the common structure, and also the bell-mouthed sheath and cable (Figure I-9) carried in the center tube. The casing is a part of the common structure since it is identical for all the lamps.

All these portions of the lamp, which are described below more in detail, are uniform in the lamp structure and are never changed. The only changes are in the working mechanism as hereafter detailed.

### MULTIPLE LAMPS.

These comprise lamps for the following circuits:

Direct Current 100 to 125 volts.

Direct Current 200 to 250 volts.

Alternating Current 100 to 120 volts, 60 cycles.

Alternating Current 100 to 120 volts, 125 and 133 cycles.

*The lamp regulating mechanisms for the above circuits are quickly interchanged.* A change from 110 volts D. C. to 220 volts D. C. and vice versa, involves simply the substitution of different magnet spools and resistance wire (the porcelain base of the rheostat is undisturbed.) This is all.

To change from D. C. to A. C., the rheostat is removed from the lamp and a reactance coil is inserted in the same space. One mechanism is unclamped from the central stem and the other substituted. This is all.

These changes are made without disturbing or taking apart any other portion of the lamp.

### THE MULTIPLE DIRECT CURRENT LAMP.

**I**N the Direct Current Multiple Lamp (Figure I-2), two solenoids are employed, the wire being wound on non-metallic bobbins, and the two mounted between clamping plates are secured to supporting brackets in a manner to facilitate ready removal, which can be accomplished in a few seconds. A U-shaped armature of Norway iron attached directly

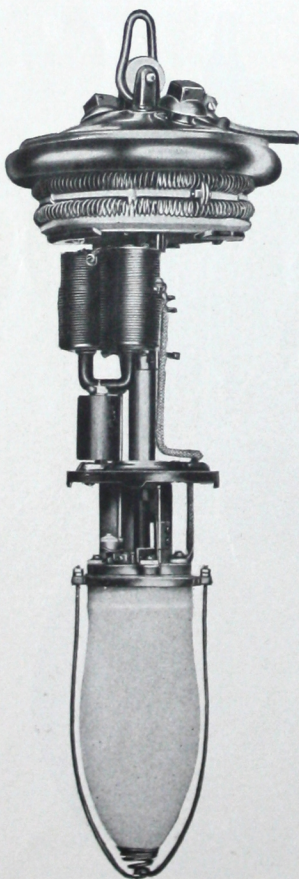


Figure I-2.



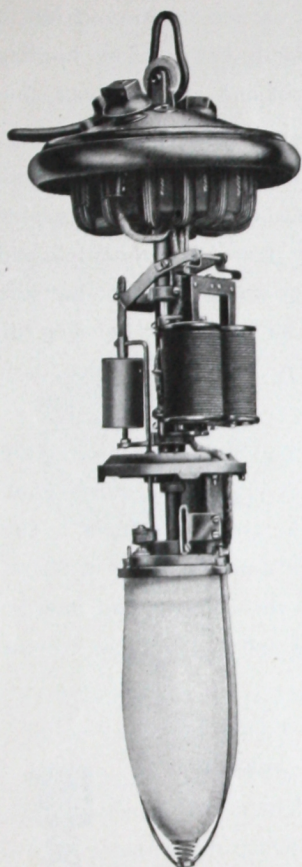


Figure I-4.

to the dash pot and clutch rod operates within the solenoids and is in magnetic suspension. Thus all frictional retardations are avoided. The solenoids are provided with taps to permit of an adjustment for amperage.

### THE MULTIPLE ALTERNATING CURRENT LAMP.

In this lamp (Figure I-4) two solenoids are also employed, the non-metallic bobbins being identical with those in the Direct current Lamp. The clamping plates on which the solenoids are mounted are secured by spring members to the supporting brackets. The laminated armature operates within the solenoids and its movement is transmitted to the clutch rod by means of a lever mounted on a knife-edge so as to be frictionless. A wide range of ampere adjustment is provided.

### STRUCTURAL DETAILS OF JANDUS LAMPS.

**T**HE following descriptions of *Structural Details* apply equally to all the Jandus Interchangeable Lamps, since almost all of the parts are identical.

**The Casing.** The casing is removably attached to the lamp frame by means of two stout screws with milled heads, which impinge upon a conical shaped floor plate, and by moving upward on the cone, seat the case firmly in the hood. The hood is a part of the permanent lamp structure, and, although removable, is never disturbed in attaching or removing the mechanism or parts thereof. The main portion of the casing consists of a *single piece* of copper or steel rolled by special machinery into cylindrical form without introducing stresses or checks in the stock. This process is of great value in preserving the integrity of the metal and prolonging its life, and is protected by special patents. The casing is separable. The small lower portion is attached to the outer globe and is removed with it in trimming.



**Switch and Binding Posts.** The switch lever is carried on the outside of the hood, a position much more desirable than below the lamp body. The binding posts are mounted on porcelain, are absolutely weatherproof and of very stout construction.

**Dash Pot.** The Jandus Company has never had any of the troubles with dash pots, so common to other manufacturers. The dash pot of the interchangeable lamp is based on long successful practice. It is of large size, removably mounted and fitted with valve for instant release. The cylinder and plunger are of different metallic composition and the relations of the temperature co-efficients of expansion between the two are such as to prevent sticking or binding in operation, and make these dash pots the simplest and most reliable upon the market.

**Clutch.** The severest conditions to which arc lamp clutches are subjected are found in the low frequency alternating lamps. The constant vibration requires good gripping leverage and proper distribution of the masses of the clutch members. The Jandus clutch is simple, durable, positive and at the same time sensitive in its release. It will not bind nor slip. It is perfectly accessible to the trimmer and may be quickly removed from the lamp. It is thoroughly insulated and conducts no current to the upper carbon.

**Sheath and Cable.** The sheath and cable shown in Figure I-9 are of a design based on long experience and are mounted within the center tube. The sheath is of phosphor bronze tube, swaged to proper diameter and bell-mouthed to facilitate insertion of the carbon. The sheath is within plain sight and reach during trimming and the cable may be inspected throughout its length through openings in the center tube. The sheath is slotted and moves up and down on a spline to prevent turning or twisting.

**Globe Cap and Shield.** A porcelain block, through which the upper carbon passes, is placed immediately above the arc. This prevents short circuits between the upper carbon and adjacent parts when the arc flames.

The shield consists of a depending flange integral with the metallic seating surface against which the inner globe bears and screens the upper end of the globe from the heat and flame of the arc when the lamp is freshly trimmed. This is a valuable feature as it protects the globe at its weakest point and minimizes breakage.

**Large Inner Globe.** The globe is of graceful design, properly shaped for the best diffusion of light, and is of large size so as to insure freedom from caving or melting down, as well as blackening from proximity to the arc. Last but not

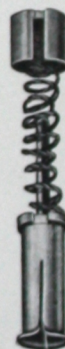


Figure I-9



least, the globe may be cleaned by the free insertion of the hand.

**Inner Globe Bale.** The supporting bale for the inner globe constitutes an important element in the design of an arc lamp. The Jandus bale is of phosphor bronze, insuring durability, positive action, and ample resilience.

**Rheostat.** The advantages of the Jandus patented rheostat used in the Multiple Direct Current lamps have become widely known. It employs three identical porcelain sections, (see Figure I-10), fitting tongue and groove fashion, and forming a cylinder around the center tube which can be readily assembled without disturbing the lamp hood. The cylinder has aligning grooves amply ventilated in which the specially coiled resistance wire is laid (see Figure I-2) and connected to the lamp circuit by binding posts conveniently located so that the removal of a coil, or of the whole rheostat, takes but a moment. Sufficient grooves are provided to take care of resistance for 250 volt lamps, while other manufacturers require an extra outside resistance for such lamps.



Figure I-10

**Reactance Coil.** In Multiple Alternating Lamps a reactance coil is substituted for the rheostat. (Compare Figures I-2 and I-4). The reactance coil occupies the same space as the rheostat and is interchangeable with it. Neither the lamp hood nor any part of the lamp is disturbed in making the substitution. The reactance coil consists of a laminated non-ageing iron core carrying a series of independent form-wound coils of wire connected on the outside of the core. The connections are utilized in making the necessary adjustments to adapt the lamp to the voltage and frequency of the circuit on which it is to be operated. Should a coil be damaged, it may be quickly replaced by another, and does not involve the rewinding of the whole apparatus as is the case with the types of reactance coils in common use.

**Accessibility and Flexibility.** The entire case, with or without the outer globe can be removed from the lamp in a moment. The magnets, armature, dash-pot, clutch, sheath and cable, in fact all working parts, can be removed and replaced in a few minutes by any mechanic.

**Outer Globe Trim.** With this lamp the Jandus Company introduces an entirely new outer globe trim, the simplest and speediest yet devised. The lower portion of the case is separable and carries the outer globe. A neat cam movement operated by the thumb of the trimmer, releases the lower case part and outer globe, and exposes to view and reach the inner globe, carbon sheath and clutch. *It is the trimmer's delight.*

**Long Life.** The Jandus Interchangeable Lamp gives a life practically double that of the enclosed lamps now sold. At the standard adjustments and with proper



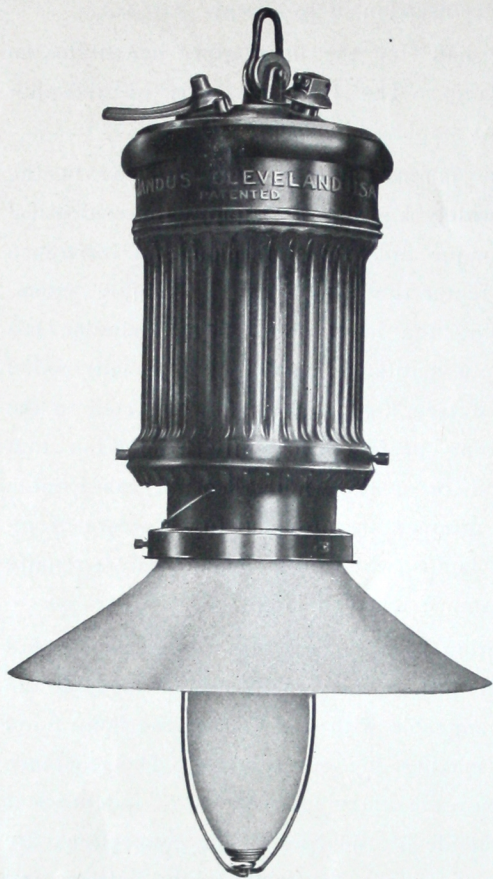


Figure 81

Figure 81 illustrates the lamp with Bell  
Porcelain Shade, No. 10.  
Inner Globe, No. 17.

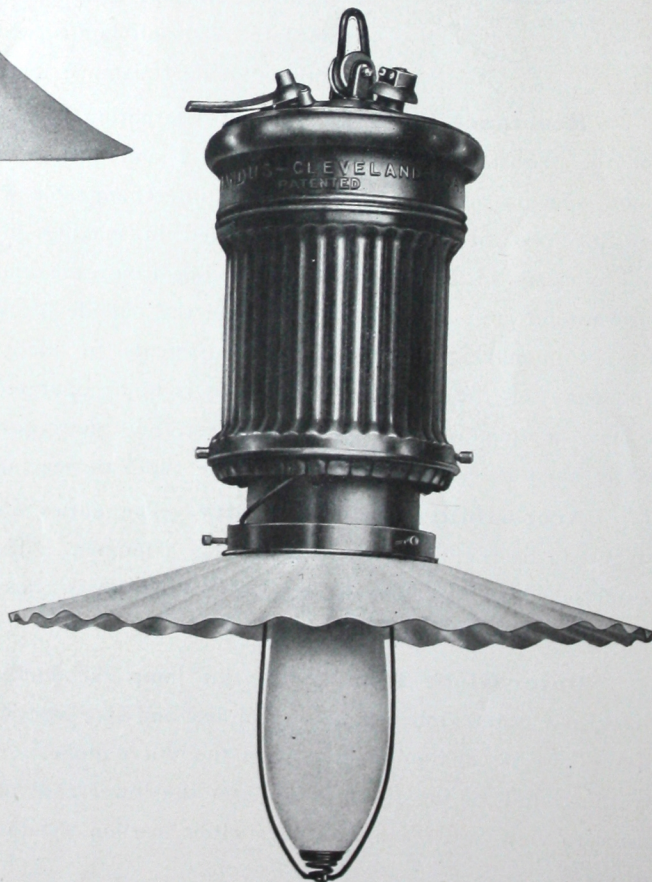


Figure 82

Figure 82 shows lamp with  
Steel Porcelain Enamel  
Shade, No. K-6.  
Inner Globe, No. 17.



globe and carbons, the company guarantees,

*200 hours for the Multiple D. C. Lamp,*

*150 hours for the Multiple A. C. Lamp.*

These astonishing results are obtained by means of a patented invention, which maintains the gasses of combustion practically uniform in the arc chamber, and permits ingress of oxygen by gradual diffusion instead of by sudden pumping. The operation of this invention also results in

**Remarkable Steadiness of Burning.** The lamp is the steadiest and most even burning lamp yet produced by the Jandus Company and challenges comparison with any arc lamp ever made. The card from a 24 hour run of the Multiple Direct

Current Lamp on a recording ammeter is almost ideal. (See Figure I-11.)

**Uniform Carbon Trim.** All the Jandus Interchangeable Lamps use a 12-inch upper carbon.

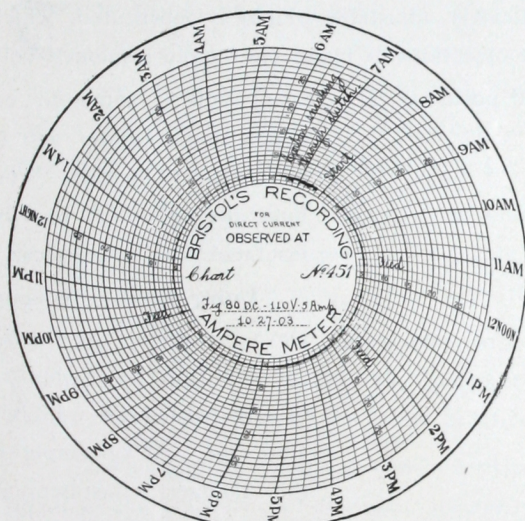


Figure I-11

In Central Station practice it is not uncommon to use the walking beam type of Multiple Alternating Current Lamp (Figure I-4) for direct current multiple service also. In this case to adapt the lamp to direct current service, it is only necessary to substitute rheostat for reactance coil and insert a lighter dash pot.

### **CONSTANT CURRENT (SERIES)** **LAMP FOR D. C. CIRCUIT.**

**T**HE mechanism for this lamp, (shown in Figure I-6) consists of two series and two shunt electro magnets with conical poles and per-

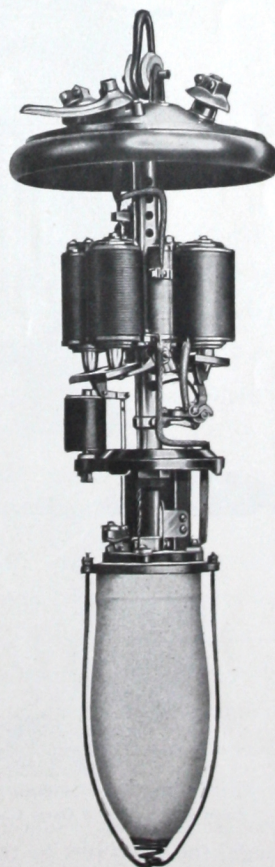


Figure I-6



forated armatures, the whole integrally mounted so as to be clamped upon the central stem in place of the mechanism of the multiple lamp with which it is interchangeable. A patented compensation device of exceedingly simple construction is embodied in the structure of the series magnets, whereby a remarkably close regulation is obtained. The regulation is very sensitive and is maintained within limits not approached in any other lamp now upon the market.

**Cut Out.** The cut out shown in Figure I-6 is clamped to the stem of the lamp. It is positive and unfailing in its action, presenting four rubbing contacts of coin silver. Old Central Station experts say it is the best arc lamp cut out now in use.

**Adjustment.** The adjusting coil of german silver wire commonly used in Series Arc Lamps is abolished, and a delicately adjustable weight is substituted, which of course is subject to no deterioration, the objectionable feature in the old fashioned coil.

**Details.** The switch is strong and positive. The teasing coil is mounted on a porcelain cylinder and is conveniently located. The lamp throughout is heavily insulated with pure mica.

**Long Life.** This lamp gives the same long life as the multiple lamps but is usually burned at a higher amperage. At 6.6 amperes, the standard adjustment, it gives a life of 175 hours. No other lamp can approach it in this respect.

**Outer Globe.** For street lighting this lamp is fitted with an outer globe, open at the bottom. It can be used in combination with shade as shown in Figure 83. In trimming, this globe is not disturbed, thus rendering the operation quick and simple.

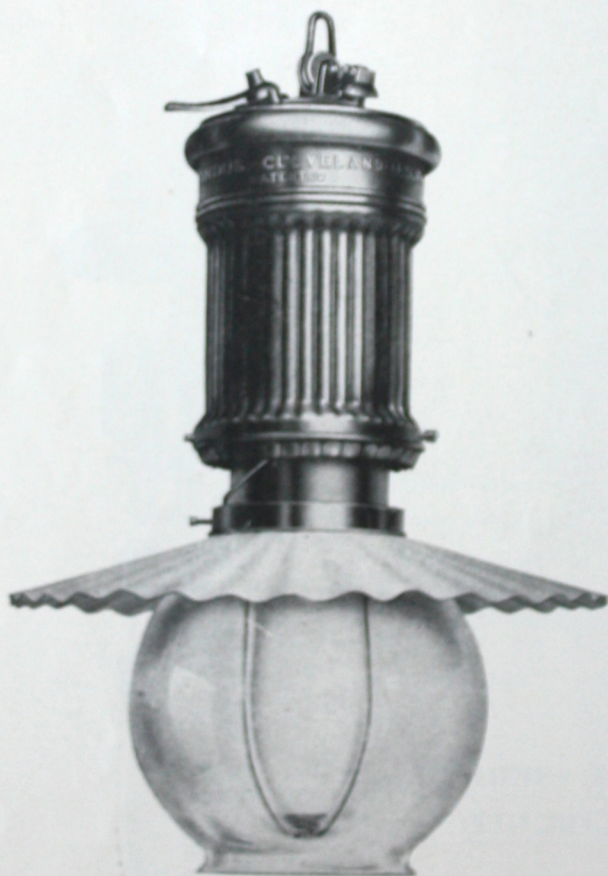


Figure 83

Street Lamp. No. 15 Outer Globe, No. 17 Inner Globe.

To change the multiple to the series lamp, unclamp and take out the multiple lamp

**Interchangeability.**



mechanism. Clamp in its place the integrally mounted series mechanism, including the cut out, adjusting weight and teasing coil. Connect the dash pot and clutch rod, and the change is complete. Any electrician can thus interchange the lamps in a few minutes.

## **MULTIPLE-SERIES LAMPS FOR POWER CIRCUITS.**

THE Multiple-Series Lamps are used two in series on light or power circuits of 220 to 250 volts, and five in series on circuits of 500 to 550 volts. These lamps are identical in construction with the Constant Current Series Lamps shown in Figure I-6 with the exception of the cut out. They carry also a rheostat (Figure I-10) like that shown in the lamp of Figure I-2 and described in detail on page 7.

These lamps are often supplied without external rheostats, and in that case must be operated in groups of two on 220 volt circuits and five on 500-550 volt circuits. The interruption of one lamp extinguishes the group.

To provide for the independent operation of each lamp on a multiple-series circuit, and to insure against the interruption of the group in case of cutting out of one lamp, the following is the latest practice of the Jandus Company:—

Each lamp is equipped with a resistance (Rheostat) in the top of the casing, equal to the resistance of the arc. In case of accident or cutting out, the resistance is automatically switched into service and while this individual lamp is extinguished the remainder of the group continue to burn normally.

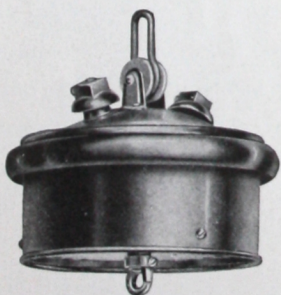


Figure I-12

The trimmer can by throwing the switch cut out any lamp in the group for the purpose of inserting globe or carbons, without disturbing the operation of the remaining lamps.

To accomplish these results an external rheostat is operated in connection with each group, which governs the circuit. See Figure I-12. This external rheostat is conveniently housed in a casing similar to that of the lamp itself, though shorter, and it is furnished with binding posts and hanger identical with those on the lamps. In practice this rheostat is hung in circuit exactly like a lamp, and at any convenient location. The casing is copper or steel according to preference.



## THE SERIES ALTERNATING LAMP.

THE Series or Constant Current Alternating Lamp, closely resembles the Direct Current Series Lamp in appearance, (see Figure I-8). The mounting of the mechanism is the same, but solenoids and laminated armatures are used instead of the electro magnets. The cut out and dash pot are the same, as are the switch and adjusting weight. This mechanism is also integrally mounted and can be interchanged in a brief space of time with that of the multiple or series direct current lamp.

**Details.** The regulation of this lamp is very fine, leaving nothing to be desired. The same long life is obtained, depending upon the amperage adjustment. At 6.6 amperes the lamp gives 175 hours, and at 7 amperes, 150 hours, a result unapproached by any other series alternating lamp. For street lighting, the lamp is fitted with porcelain enameled steel reflector and outer globe, open at the bottom, so that the hand may be freely inserted for trimming without disturbing the outer globe (Figure 83).

A separate Bulletin (No. 21) is issued, descriptive of the Jandus Series Alternating Current System, including Lamp, Regulator, Switchboard, Etc.

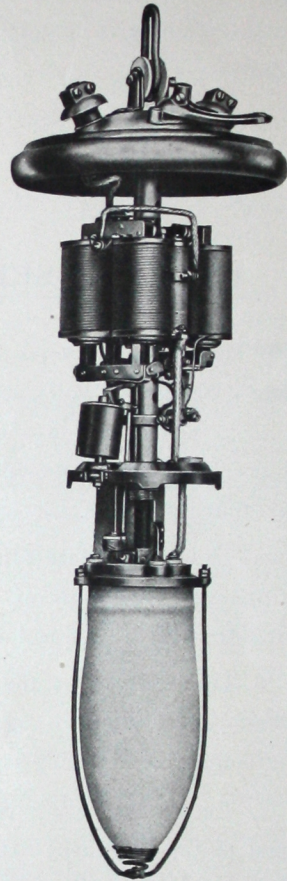


Figure I-8

## IN CONCLUSION

It will be noted that the Jandus Interchangeable Lamps involve one common structure and several carefully perfected mechanisms. Each mechanism is integrally mounted, and can be placed in the common structure or removed therefrom in a short time by any mechanic with electrical knowledge, thus transforming the lamp from one service to another and obtaining any of the six lamps called for by modern Central Station practice.

## TO THE JANDUS ELECTRIC COMPANY

The managers of three of the largest Central Stations in the country thus express themselves :

"Your latest lamp is a truly great achievement."

"The best lamp individually, and by all odds the best for the Central Station.



"My congratulations. Our trials show that we want it, and I predict that others must have it too."

### SUMMARY.

One lamp interchangeable for all circuits.  
The best burning lamp individually.  
The longest life.  
The quickest trim.  
Saves half the carbon bills and half the trimming expense.  
A short lamp, 28 to 30 inches over all.  
Uniform 12-inch upper carbon trim.  
A handsome ornamental copper case of colonial design.

Every part accessible for inspection.

Each individual part can be removed in a moment without disturbing the lamp structure.

Every detail of construction leads modern practice.

Inner globe that does not break and can be cleaned by free insertion of the hand.

It is so great a money saver, that it will pay to throw out the old lamps and introduce the Jandus Interchangeable Lamp.

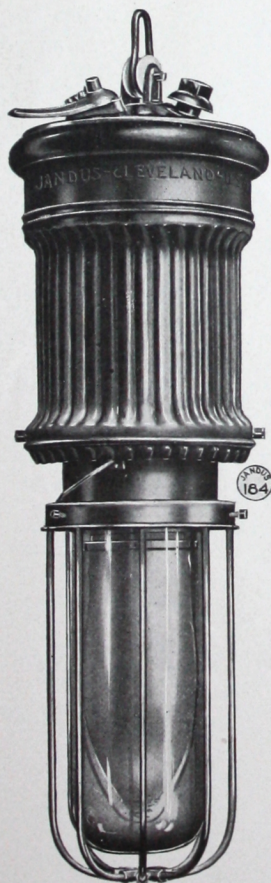


Figure I-9

### MARINE TYPE LAMP.

Figure I-9 shows the Jandus Lamp arranged for Marine service. The mechanism of this lamp is that of the regular Multiple Lamp, shown in Figure I-2.



## MINIATURE ARC LAMPS.

The Jandus Electric Company manufactures Miniature Arc Lamps of ornamental design, which have gone into very extensive use for lighting show windows, offices, low ceiling space in stores, etc. A special Bulletin (No. 4) describing the miniature lamps may be had on application.

*Note.* A Bulletin of special interest to Central Stations is that descriptive of the Jandus Series Alternating System (No. 21) which will be mailed on request.

Price lists of parts, direction sheets and all other useful printed information is furnished to customers promptly on application.

## COMPARATIVE COST DATA.

KIND OF LAMP	Current	Volts Terminal	Hours Life	Cost of Carbon, Globes and Trimming per Year.	
				*Commercial	†Central Station
Multiple Direct Current.....	5 Amps.	110	125	1.23	3.79
<b>Jandus Multiple Direct Current...</b>	<b>5 Amps.</b>	<b>110</b>	<b>200</b>	<b>.72</b>	<b>1.89</b>
Multiple Alternating.....	6 Amps.	104	90	1.54	4.70
<b>Jandus Multiple Alternating.....</b>	<b>6 Amps.</b>	<b>104</b>	<b>160</b>	<b>.77</b>	<b>2.35</b>
D. C. Constant Current (Series).....	9.6 Amps.	50	7½ to 15	3.42	10.46
D. C. Constant Current (Series).....	6.6 Amps.	73	90	1.54	4.70
<b>Jandus D. C. Constant Current (Series).....</b>	<b>6.6 Amps</b>	<b>72</b>	<b>175</b>	<b>.77</b>	<b>2.35</b>
A. C. Constant Current (Series).....	6.6 Amps.	78	80	1.65	5.08
<b>Jandus A. C. Constant Current (Series).....</b>	<b>6.6 Amps</b>	<b>78</b>	<b>175</b>	<b>.80</b>	<b>2.40</b>

\*4 hours per day, 312 days per year.

†10½ hours per day, 365 days per year.



## JANDUS INTERCHANGEABLE ARC LAMPS.

Length with Outer Globe, 30 inches.      *Uniform 12-inch Upper Carbon Trim.*      Length with Shade, 28 inches.

Code Word	Circuits	Volts	Case	Finish	*Weight Weight	* 6 in. box	*Dimensions, Box of 6	Lower Carbon	Price
Macedonian	Multiple Direct Current	100-125	Steel	Japan or Bauer Barff	18 lbs.	250 lbs.	44 x 26 x 22 in.	½ in. x 5¼ in.	\$20.00
Mackerel	" " "	200-250	"	" " "	"	"	"	½ in. x 5¼ in.	20.00
Mackintosh	" " "	100-125	"	Oxidized Copper	"	"	"	½ in. x 5¼ in.	21.00
Macrometer	" " "	200-250	"	" " "	"	"	"	½ in. x 5¼ in.	21.00
Macropod	" " "	100-125	Copper	" " "	"	"	"	½ in. x 5¼ in.	22.50
Madeira	" " "	200-250	"	" " "	"	"	"	½ in. x 5¼ in.	23.50
Madrigal	Series D.C.(Const. Cur.)		"	" " "	21 lbs.	"	"	½ in. x 5¼ in.	31.00
Magenta	Multiple-Series D. C.	200-550	Steel	Japan or Bauer Barff	23 "	260 lbs.	"	½ in. x 5¼ in.	29.00
Magic	" " "	200-550	Copper	Oxidized Copper	23 "	"	"	"	31.00
Magnate	Multiple, Alternating	100-125	"	" " "	25 "	270 lbs.	"	½ in. x 6 in.	29.00
Magnum	Series, "		"	" " "	21 "	250 "	"	½ in. x 6 in.	31.00
Magnolia	Marine Lamp .....	100-125	Steel	Japan	23 "	260 "	"	½ in. x 5¼ in.	23.50
Magpie	" " .....	100-125	Copper	Oxidized Copper	23 "	"	"	"	25.00

\*Exclusive of Glassware.

*Note.* Lamps are shipped already trimmed with upper and lower carbon. Thereafter it is necessary only to purchase 12 inch x ½ inch solid carbons for Direct Current Lamps and one-half each of solid and cored carbons of same size for Alternating Current Lamps.

### EXTERNAL RHEOSTATS (Weather-Proof) FOR MULTIPLE SERIES LAMPS.

For series of two lamps (200 to 250 V.)	Japan Steel Cased .....	\$4.25.	Code word, Monogram
" " of five lamps (500 to 550 V.)	Copper Cased .....	5.00.	" " Monologue
" " of five lamps (500 to 550 V.)	Japan Steel Cased .....	7.00.	" " Monopole
" " of five lamps (500 to 550 V.)	Copper Cased .....	8.00.	" " Montague

## GLOBES AND SHADES FOR JANDUS INTERCHANGEABLE LAMPS.

Code Word	Designation	Size	Description	Dimensions Casks of 12	Weight Packed	Price, Each
Handle	Outer Globe No. 16....	12-inch Ball	Clear Glass	45 x 45 x 45	260 lbs.	\$1.00
Happen	" " " " .....	" "	Opal "	"	"	1.20
Hammer	" " " " .....	12-inch Open	Clear "	"	"	1.00
Hedge	" " " " .....	" "	Opal "	"	"	1.20
Helmet	Bell Shade No. 10....	16-inch Diam.	" "	29 x 21 x 21	60 lbs.	1.20
Hesper	Dome Shade No. 11....	" "	" "	"	"	1.20
Hopper	K-6 Shade .....	20-inch Diam.	Steel Porcelain	22 x 15 x 22	"	1.50
Humble	Inner Globe No. 17....	8¾ x 3¾	Clear Glass	*34 x 20 x 28	100 lbs.	.20
Homely	" " " " .....	" "	Opal "	* " "	"	.25

\*72 in box.

## CARBONS.

	1000 Lots or More	500 Lots or More	100 Lots or Less than 500
Price of Carbons, ½ inch x 12 inch, Solid .....	\$27.50 per 1000	\$30.00 per 100	\$3.50 per 100
" " " " " Cored .....	29.50 "	32.00 "	3.75 "

*Note.* Alternating Current Lamps, whether Multiple or Series, must be trimmed with one solid and one cored carbon. The cored carbon may be either upper or lower.



